

Pennsylvania.—Dyberry, trace.
Vermont.—Stowe, 5; Strafford, 3; Post Mills, 1.
Washington Territory.—Spokane Falls, 0.3.
Wisconsin.—Embarras, 14; Madison, 13.5; Milwaukee, 6; Neillsville, 1 to 5; La Crosse, 0.5.

HAIL.

Fall Brook, San Diego county, California: a heavy fall of hail occurred at 8 a. m. of the 18th, lasting several minutes. The stones, which were the size of peas, fell in sufficient quantity to whiten the ground and remained unmelted for half an hour. Hail showers also occurred at 8.30 and 11.30 a. m. and 2.30 p. m. of the same day.

Birmingham, Jefferson county, Alabama: a violent hail storm occurred at 3.30 p. m. of the 29th, lasting five minutes. The stones, which were of clear ice, were generally spherical in shape and of the size of chestnuts. Considerable damage was done to gardens, skylights, etc.

SLEET.

Sleet occurred in the various states and territories during the month, as follows:

Alabama.—Montgomery, 4th; Greensborough, 31st.
Connecticut.—Bethel, 19th; New Haven, 21st.
Dakota.—Fort Buford, 12th, 15th.
Georgia.—Quitman, 13th.
Idaho.—Boisé City, 16th, 26th.
Indiana.—Indianapolis, 5th, 13th; Vevay, 21st.
Iowa.—Independence, 11th; Davenport, 11th, 12th, 20th; Cedar Rapids, 14th; Oskaloosa, 28th.
Kansas.—Ottawa, 1st; Independence, 2d; El Dorado, 2d, 24th, 25th; Fort Riley, 4th; Yates Centre, 20th; Ninnescah, 28th.
Maine.—Portland, 12th, 16th, 20th, 21st, 29th, 30th; Eastport, 15th, 16th, 21st, 22d.
Massachusetts.—Princeton, 21st.
Michigan.—Grand Haven, 15th, 28th; Escanaba, 17th, 20th, 21st; Marquette, 19th.
Minnesota.—Saint Paul, 19th.
Missouri.—Lamar, 25th, 29th.
Nebraska.—Brownville, 4th; Valentine, 18th.
New Jersey.—Dover, 12th, 22d, 23d, 27th.
New York.—Le Roy, 12th; Setauket, 27th; Fort Columbus, 28th.
Ohio.—Cleveland, 12th, 21st; Columbus, 21st.
Pennsylvania.—Easton, 18th to 21st.
South Carolina.—Spartanburg, 10th.
Tennessee.—Memphis, 4th.
Texas.—Abilene and El Paso, 29th.
Vermont.—Poultney, 8th.
Virginia.—Fort Myer, 12th.
Washington Territory.—Olympia, 7th, 15th; Tatoosh Island, 15th; Walla Walla, 19th, 24th, 31st; Pysht, 24th, 25th; Fort Spokane, 31st.
Wisconsin.—La Crosse and Madison, 20th.

TEMPERATURE OF WATER.

Observations were interrupted by ice throughout the month at the following stations: Duluth, Minnesota; Escanaba, Marquette, Mackinaw City, and Alpena, Michigan; Milwaukee, Wisconsin. Observations were also interrupted by ice at Chicago, Illinois, from the 1st to 11th; Detroit, Michigan, 1st to 10th, 13th, 14th, 15th; Toledo, Ohio, 1st to 14th; Sandusky, Ohio, 1st to 20th; Cleveland, Ohio, 1st to 14th, 22d, 23d, 27th, 28th; Buffalo, New York, 1st to 23d. Observations were suspended during the month at Indianola, Texas, and at San Francisco, California, from the 22d to 31st.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for March, 1886.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	43.0	33.9	9.1	8.9	34.1
Alpena, Michigan*	61.0	47.9	13.1	10.1	54.2
Augusta, Georgia	45.5	33.2	12.3	10.0	41.6
Baltimore, Maryland	38.1	28.1	10.0	8.3	34.2
Block Island, Rhode Island	40.1	29.3	10.8	20.0	33.7
Boston, Massachusetts	39.6	33.5	6.1	10.0	31.0
Buffalo, New York*	68.9	53.8	15.1	8.6	59.2
Cedar Keys, Florida	59.0	48.7	10.3	38.2	53.9
Charleston, South Carolina	39.2	33.6	5.6	8.2	36.1
Chicago, Illinois*	50.4	31.4	19.0	3.3	41.4
Chincoteague, Virginia	39.0	33.3	5.7	14.0	34.9
Cleveland, Ohio*	35.4	33.0	2.4	22.6	35.6
Detroit, Michigan*	36.0	31.5	4.5	16.9	28.1
Duluth, Minnesota*	68.0	56.2	11.8	12.8	59.0
Eastport, Maine	37.4	31.1	6.3	19.0	30.4
Escanaba, Michigan*	69.7	55.1	14.6	18.0	59.9
Galveston, Texas	58.0	43.0	15.0	8.3	49.3
Grand Haven, Michigan	64.0	51.2	12.8	17.0	56.7
Indianola, Texas†	39.0	30.7	8.3	16.2	34.3
Jacksonville, Florida	37.9	32.7	5.2	12.7	35.1
Key West, Florida	40.0	31.0	9.0	18.0	36.9
Mackinaw City, Michigan*	51.3	38.1	13.2	15.8	46.3
Macon, Fort, North Carolina	64.4	55.1	9.3	17.5	57.3
Marquette, Michigan*	37.8	30.5	7.3	16.1	29.2
Milwaukee, Wisconsin*	49.8	43.0	6.8	52.6	44.8
Mobile, Alabama	41.4	37.9	3.5	10.0	34.9
New Haven, Connecticut	38.9	28.1	10.8	9.3	36.8
New London, Connecticut	55.0	53.9	1.1	39.2	52.6
New York City	63.1	47.1	16.0	9.7	57.2
Norfolk, Virginia	62.9	42.0	20.9	10.8	50.4
Pennacola, Florida	42.3	32.9	9.4	13.0	34.0
Portland, Maine	58.8	45.9	12.9	12.0	52.5
Portland, Oregon					
Sandusky, Ohio*					
Sandy Hook, New Jersey					
San Francisco, California†					
Savannah, Georgia					
Smithville, North Carolina					
Toledo, Ohio*					
Wilmington, North Carolina					

* Observations interrupted by ice; see text. † Observations temporarily suspended.

WINDS.

The most frequent directions of the wind during March, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the tables of miscellaneous meteorological data. In the upper Mississippi and Missouri valleys, and on the Atlantic coast north of the thirty-fifth parallel the prevailing winds were northwesterly; in the lower lake region, Ohio Valley, south Atlantic and east Gulf states they were from southwest to northwest; in the middle and southern Rocky Mountain districts and in the west Gulf states they were variable; in the northern slope and northern plateau they were southwesterly; on the California coast they were westerly at all stations, except northwesterly at Cape Mendocino; in the north Pacific coast region they were from south and southwest, except northerly at Roseburg, Oregon.

HIGH WINDS.

[In miles per hour.]

Wind-velocities of fifty or more miles per hour were reported during the month, as follows:

Mount Washington, New Hampshire, 115, nw., 1st; 90, nw., 2d; 64, ne., 4th; 66, nw., 5th; 84, nw., 6th; 72, nw., 7th; 54, nw., 8th; 67, nw., 10th; 90, n., 11th; 82, nw., 12th; 83, nw., 14th; 52, nw., 15th; 60, nw., 16th; 80, nw., 18th; 86, e., 21st; 64, nw., 22d; 80, nw., 23d; 65, nw., 24th; 100, w., 25th; 101, nw., 26th; 75, nw., 27th; 78, sw., 29th; 69, w., 30th; 100, s., 31st.

Pike's Peak, Colorado, 60, nw., 7th; 74, sw., 10th; 70, w., 13th; 76, w., 14th; 54, w., 15th; 56, w., 16th; 68, w., 17th; 56, w., 18th; 52, sw., 19th; 50, n., 20th; 64, w., 24th.

Cape Mendocino, California, 70, se., 8th; 52, se., 16th; 54, nw., 18th; 62, se., 21st; 60, se., 22d; 58, se., 23d; 62, se., 31st.

Fort Buford, Dakota, 52, w., 24th.

Fort Sill, Indian Territory, 52, se., 11th.

Dodge City, Kansas, 52, s., 18th.

Fort Assinaboine, Montana, 54, w., 23d.

Sandy Hook, New Jersey, 60, nw., 1st; 60, nw., 2d; 56, nw., 23d.

New York City, 54, nw., 2d.

Fort Macon, North Carolina, 51, sw., 21st.

Chincoteague, Virginia, 51, nw., 2d.

LOCAL STORMS AND TORNAOES.

Vevay, Switzerland county, Indiana: a heavy thunder-storm, attended by a violent gale moving from south to north-east, occurred from 5.30 to 6.10 p. m. of the 20th. Houses were unroofed, the top stories of substantial brick buildings carried away, and chimneys, trees, fences, etc., prostrated within a path six hundred feet in width; heavy rain and light hail accompanied the storm. After passing over this place no other damage was done until the storm reached Bethel Church, six miles northeast of this station, where it carried away the roof and rafters of the church and deposited them two hundred feet away.

Savannah, Georgia: two tornadoes occurred in this vicinity about 4 p. m. of the 20th; one in Ware county, near Waycross, which moved from southwest to northeast, with a track about two hundred yards wide, and the other in the northern part of Chatham county. No great damage was done by either, as their tracks were through a pine wood country.

Helena, Phillips county, Arkansas: a tornado occurred about 4.30 p. m. of the 29th, doing considerable damage in this city. The direction of movement was from west to east. West of the hills, which act as a barrier to the city, it was more violent, blowing down houses and rendering some of the roads impassable by the fallen trees. The loss is estimated at about \$10,000.

Grove Hill, Clarke county, Alabama: a tornado passed near this place on the 27th, doing considerable damage to timber and fencing. The storm came from the west and its track was one-fourth of a mile wide.

Smith's Station, Lee county, Alabama: a tornado passed over this section during the storm of the 29th and 30th, doing much damage to property in its track, the width of which was about one hundred yards; the storm moved from the southwest. Some small buildings were destroyed, fences blown down, and several persons slightly injured.

The following are accounts of tornadoes which occurred during March, 1886, forwarded by special tornado observers:

Belmore, Putnam county, Ohio: a tornado occurred at 8.30 p. m. of the 20th, passing from southwest to northeast; one church was badly damaged.

Williamsport, Allen county, Indiana: a severe storm, probably a tornado, occurred at 5.30 p. m. of the 20th, destroying two churches, several barns, and killing a few cattle.

Several tornadoes are reported to have occurred on the afternoon of the 29th in Georgia. In Bullock county, a church was destroyed, four persons were killed and ten badly injured; at LaGrange, Troup county, several old buildings were thrown down; near Palmetto, Campbell county, one house was destroyed and three persons fatally injured.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The Mississippi River reached its highest stage during the month at all stations north of Cairo, Illinois, from the 28th to 31st. At Keokuk, Iowa, it passed the danger-line on the 30th, and at the close of the month was .3 of a foot above this point; navigation was practically resumed at all points between Keokuk, Iowa, and Saint Paul, Minnesota, from the 16th to 28th. At Cairo a gradual rise set in on the 23d, and on the 31st the water was within .9 of a foot of the danger-line, and continued rising.

The Ohio River at Pittsburg, Pennsylvania, which had been rising slowly since the 12th, reached its highest stage, 14.1 feet, on the morning of the 23d, after which the water began to recede.

The Tennessee River at Knoxville, Tennessee, was remarkably low on the 17th, the gauge showing but 1.2 feet, and on the 19th the water was two inches lower. A decided rise set in on the 28th, and at 2 p. m. of the 31st had reached a height of 29.5 feet, a rise of 18.7 feet in the preceeding twenty-four hours.

In the following table are shown the danger-points at the

various river stations; the highest and lowest depths for March, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, March, 1886.

[Expressed in feet and tenths.]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, Louisiana.....	29.9	28	17.6	1, 2	13.0	4.6
<i>Arkansas River:</i>						
Fort Smith, Arkansas.....	22.0	11	9.2	29	4.7	4.5
Little Rock, Arkansas.....	23.0	14	10.1	28, 29	6.1	4.0
<i>Missouri River:</i>						
Yankton, Dakota.....	24.0	18	14.1	31	10.0	4.1
Omaha, Nebraska.....	18.0	29	9.4	17	8.0	1.4
Leavenworth, Kansas.....	20.0	26	14.9	12, 13, 14	7.6	7.3
<i>Mississippi River:</i>						
Saint Paul, Minnesota.....	14.5	29, 31	8.2	25	6.0	2.2
La Crosse, Wisconsin.....	24.0	31	7.7	22	5.8	1.9
Dubuque, Iowa.....	16.0					
Davenport, Iowa.....	15.0	28	9.7	20	7.8	1.9
Keokuk, Iowa.....	14.0	31	14.3	17	6.1	8.2
Saint Louis, Missouri.....	32.0	30	23.2	15, 17, 18	14.9	8.3
Cairo, Illinois.....	40.0	31	39.1	19, 20	20.4	18.7
Memphis, Tennessee.....	34.0	1	28.0	23	14.4	14.2
Vicksburg, Mississippi.....	41.0	6	39.0	26	24.2	14.8
New Orleans, Louisiana.....	13.0	9, 12	13.1	31	9.6	3.5
<i>Ohio River:</i>						
Pittsburg, Pennsylvania.....	22.0	23	14.1	11	2.9	11.2
Cincinnati, Ohio.....	50.0	31	40.4	14	12.3	28.1
Louisville, Kentucky.....	25.0	31	14.9	15	6.1	8.8
<i>Cumberland River:</i>						
Nashville, Tennessee.....	40.0	31	33.2	15	6.5	31.7
<i>Tennessee River:</i>						
Knoxville, Tennessee.....	31	29, 6	19	1.1	29.5	
Chattanooga, Tennessee.....	33.0	31	43.0	12, 20	5.0	38.0
<i>Monongahela River:</i>						
Pittsburg, Pennsylvania.....	29.0	23	14.1	11	2.9	11.2
<i>Savannah River:</i>						
Augusta, Georgia.....	32.0	31	30.8	20	7.8	23.0
<i>Mobile River:</i>						
Mobile, Alabama.....	28	18.2	2	15.6	2.6	
<i>Sacramento River:</i>						
Red Bluff, California.....	10	3.6	29, 30, 31	2.7	0.9	
Sacramento, California.....	6	19.5	31	17.5	2.0	
<i>Willamette River:</i>						
Portland, Oregon.....	24	8.7	3, 4, 5	3.0	5.7	
<i>Colorado River:</i>						
Yuma, Arizona.....	6	18.3	1	15.3	3.0	

* Observations interrupted by ice; see text.

ICE IN RIVERS AND HARBORS.

Mississippi River.—Saint Paul, Minnesota: the ice dam below Robert street bridge broke at 2.30 p. m. of the 25th, and passed out without doing damage. Owing to the many obstructions in the river above the bridge the dam remained intact until the 31st, on which date it moved a short distance.

Red Wing, Goodhue county, Minnesota: river opened and ice ran out on 25th.

La Crosse, Wisconsin: river frozen from the 1st to 21st; river clear of ice along the Wisconsin shore, and extending one quarter of the distance across, from the 22d to 26th; heavy floating ice on the 27th; river clear of ice and navigation opened on the 28th; the steamer "Percy Swain," the first boat of the season, arrived on the 29th.

Muscatine, Muscatine county, Iowa: the ice in the river broke and ran out on the 18th; the first steamboat of the season arrived on the 29th.

Davenport, Iowa: river frozen, 1st to 18th; river open on the 19th; the steamer "Wes Rambo" arrived and departed on the 22d, opening navigation for the season.

Keokuk, Iowa: the ice dam in the river on the 4th extended from three miles north of this city to Quincy, Illinois; the ice commenced to break on the 14th, and on the 15th the channel was clear from this point to Saint Louis. The Warsaw packet "Patience" resumed her regular trips on the 16th, opening navigation for the season.

Saint Louis, Missouri: floating ice, 4th to 10th.

Missouri River.—Yankton, Dakota: the ice in the river broke and passed out during the night of the 17th, but gorged at Elk Point on the 20th.

Omaha, Nebraska: the ice in the river began to move on the 15th; river open, 17th.

Leavenworth, Kansas: floating ice in river, 1st to 6th.

Platte River.—Yutan, Saunders county, Nebraska: ice broke on the 18th; river clear of ice, 22d.